Appendix Y. September 2009 – *Deepwater Horizon* Follow-up Rig Audit

Introduction

This appendix summarizes the findings of a BP audit of *Deepwater Horizon* conducted in September 2009.

Background

On September 13, 2009, a rig and marine assurance audit commissioned by BP commenced on the semi-submersible drilling rig *Deepwater Horizon*. This was a follow-up audit to a BP audit conducted in the first quarter of 2008. The most significant outcome of the September 2009 audit was a recommendation to suspend BP operations on *Deepwater Horizon* until six Class 1 marine findings were satisfactorily addressed. The rig audit team leader conducted a verbal closeout session with the BP and Transocean personnel on the rig. The audit was completed on September 17, 2009.

The main audit issues and priorities were documented in an email from the lead rig auditor to the BP engineers for *Deepwater Horizon*, dated September 18, 2009. The email listed the findings that were required to be completed prior to *Deepwater Horizon* recommencing operations. The marine group in the Gulf of Mexico strategic performance unit (SPU) liaised with *Deepwater Horizon* and Transocean to ensure that the high-priority marine recommendations were addressed before the rig went back to work on September 22, 2009. The final audit report was issued on September 30, 2009.

Audit Executive Summary

The September 2009 rig audit executive summary included the following 'findings of particular note' related to equipment maintenance:

- "Closing out of the last audit recommendations had no apparent verification by BP. Consequently a number of the recommendations that Transocean had indicated as closed out had either deteriorated again or not been suitably addressed in the first instance."
- "Overdue planned maintenance considered excessive 390 jobs amounting to 3,545 man-hours. With the recent shift from Empac to RMS II maintenance systems and revised maintenance scheduling the back log does not look as though it will improve."
- "Lower (test), middle, and upper [blowout preventer] BOP ram bonnets are original and out with [original equipment manufacturer] OEM and [American Petroleum Institute] API five year recommended recertification period."

Audit Observations

In the Observation sections of the audit report, the following items were noted:

Previous Audit Observation section:

- "Overall expectations with respect to close out of class one and two recommendations were not entirely met and while it is appreciated that a good number of findings had been addressed by hard work and effort there were too many that had not."

Audit, Assurance and Learning Observation section:

- "The maintenance summary in the PMAA highlighted the fact that Empac was being utilized onboard. There has since been a change to the RMS II. Personnel were still becoming familiar with the new system and needed to be more knowledgeable in its use. (e.g., when accessing the DROPS data on the rig floor, there was an issue in locating items found in inspection that had been carried out)"

Well Control Observation section:

- "Following time spent with the Subsea department it was evident that most well control related equipment maintenance is being recorded out with RMS II on separate spreadsheets and in the daily log book."
- "The previously reported 'holed' hot line has been renewed but the boost hose is original supply and dated 1999, and clearly out with Transocean's five-year replacement policy. Indeed it could not be established by way of maintenance records that high pressure hoses are being maintained in accordance with RMS II requirements."

Maintenance Observation section:

- "Although former maintenance history has been copied across to RMS II, based on conversations and observation, it is evident that Transocean has not fully set the rig up for success in terms of maintenance management."
- "With the excessive overdue maintenance and the recent introduction of more maintenance routines it would appear that the maintenance department is struggling to stay in touch with the planned maintenance schedule."

Audit Findings

There were a total of 188 audit findings, with 31 related to well control maintenance. Of those, six findings were specifically related to the BOP. *Table 1* identifies the audit findings specific to the BOP. All six were outstanding as of December 2009. Although all these findings highlight deficiencies in BOP maintenance, none of them appear to have contributed to the accident, assuming they had remained outstanding.

Table 1. List of BOP Maintenance-related Audit Findings.

Item No.	Audit Finding Description
1.2.1	"The test, middle and upper pipe ram BOP bonnets are original. They have not been subject to OEM inspection and recertification in accordance with API and OEM requirements. Transocean propose a change out plan commencing in 2010 for completion in 2011."
1.3.1	"With the exception of the DP control system a comprehensive software management system for critical software such as the BOP control system, ballast control system and vessel management system could not be demonstrated."
2.2.1	"The BOP control unit triplex pump pressure relief valve was last recalibrated during August 2007. It is subsequently now overdue the 2 year recertification period as per API recommended practice."
2.2.9	"According to maintenance history choke manifold valves have not been opened up for periodic inspection and overhaul in line with API recommended practice. Consequently only valves failing to meet pressure test requirements have been inspected."
2.2.10	"One of the BOP high pressure boost hoses has been in service since December 1999. The hose is in poor fabric condition and has not been maintained in accordance with Transocean yearly or 5-yearly maintenance requirements. It was communicated that delivery date for a replacement hose was in March 2010."
3.2.10	"Much of the well control maintenance was either recorded in the Subsea Engineers daily log book or on various spreadsheets. The level of well control related maintenance history recorded in RMS II was minimal by comparison."

(**Note:** the audit numbering system is derived as X.Y.ZZ, where X= Class category, Y=Function category, ZZ= Finding number).

The class categories are defined as:

Class 1 Items that do not comply with BP policies or standards.
Class 2 Items that are outside API, legislation and rig owner policies and have potential for high safety or environmental impact.
Class 3 Items expected to be in place from a combination of competent driling contractor and knowledgeable operator.
Class 4 Items that can be used by drilling contractor and/or BP to build on the project, although they are not considred essential.

The function categories are defined as:

1. Health, Safety and Safety Management
2. Drilling and Well Control
3. Technical Services
4. Marine
5. Environmental
6. Mechanical Handling

Conclusion

The audit found a total of 31 findings related to well control maintenance. The audit findings suggested potential weaknesses in maintenance planning and work execution. The audit team also found the recording of maintenance activities to have been insufficient.